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MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM. INTRODUCTION TO THE MODEL STATE INFORMATION SYSTEM (MSIS)

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INTRODUCTION TO THE

MODEL STATE INFORMATION SYSTEM (MSIS)

Prepared For The

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Abstract

The Model State Information System (MSIS) is a computer-based information system which can be utilized by individual States and/or EPA Regions to perform the minimum data management functions mandated by the Safe Drinking Water Act of 1974 (PL 93-523).

Three major documents were produced by American Management Systems, Inc., for EPA outlining the basic concepts of an informational data management system to meet the water quality monitoring and reporting requirements of the Act. These include:

(Document 1) Feasibility Study for Development and Implementation of a Model State Information System for EPA's Safe Drinking Water Program. June 15, 1976

(Document 2) Introduction to the Model State Information System (MSIS). June 15, 1976

(Document 3) Model State Information System for Safe Drinking Water Program. June 15, 1976. 3 volumes

The South Western Ohio Regional Computer Center (SWORCC) has been engaged by EPA to perform the detailed system design, programming, testing, and documentation of the MSIS. The detailed development phase is currently underway, and all work should be completed by early March 1977.

The MSIS consists of eight subsystems: (1) Public Water Supply Inventory; (2) Water Quality Compliance; (3) Regulations; (4) Federal Reporting; (5) Variances and Exemptions; (6) Enforcement Actions; (7) Sanitary Survey; and (8) Operator and Mailing.

The first four subsystems comprise the basic package, which is required if any portion of the MSIS is to be used. States may select the base package and one or more optional sub-systems, depending on their volume of data and individual needs.

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I. OVERVIEW

The Model State Information System (MSIS) is a computer-based information system for use by individual states in managing the increased volume of water quality and related data that will be required to implement the recently promulgated National Interim Primary Drinking Water Regulations. While it is primarily designed for those states that do not currently have an automated system, it is also designed to provide enhanced capabilities to states with automated systems.

Principal Functions

States will have the option of selecting a base package of features, plus one or more optional features, depending on their volume of data and individual preferences. The system will perform the following principal functions:

Base Package

- Maintain records of each public water system in a state, containing such information as the name, address, population served, number of service connections, source of water, and treatment techniques used.

- Maintain records of samples and laboratory tests and provide detail and summary reports to state water supply managers on violations of the regulations.

- Maintain accurate and up-to-date records of regulatory requirements, such as MCLs and monitoring frequencies.

- Provide compliance data to EPA in computer compatible form on at least an annual basis.

Optional Features:

- Maintain records of compliance schedules under variance and exemption (V&E) agreements and produce reports of compliance with scheduled milestones.

- Provide a capability to automatically schedule periodic sanitary surveys based on priority factors such as population served and compliance history, in addition to date of last survey.

- Maintain records of specific enforcement actions to assist in case tracking and compliance monitoring.

- Provide a capability to manage data on certified operators and automatically print mailing labels for rapid and inexpensive communication with target populations such as water supply operators, laboratories, and local health officials.

Key Benefits

MSIS will provide states with these key benefits:

- Reduction in administrative costs of implementing the new regulations by utilizing efficient computer-based techniques rather than manual recordkeeping. Costs of manual systems increase linearly with workload; costs of computer-based systems do not.

- Greatly reduced costs of software development, training, and installation by using the EPA developed system instead of a custom built system.

- Timely and accurate reports of compliance with both Federal and state drinking water regulations.

- Positive control over sampling programs of local water suppliers with an optional, computer-initiated sample scheduling feature and appropriate audit trails.

- Better utilization of scarce technical manpower by priority targeting of state inspection programs.

- Automatic monitoring of compliance schedules under variances and exemptions.

Legal Issue

MSIS computer records and computer printed reports are not necessarily legally admissible as evidence. State laws differ in this regard; states planning to use MSIS should obtain a legal opinion from their state's chief legal officer before relying solely on computer stored information as evidence.

II. SUBSYSTEM HIGHLIGHTS

A. PUBLIC WATER SYSTEMS (PWS) INVENTORY SUBSYSTEM
B. WATER QUALITY COMPLIANCE SUBSYSTEM
C. REGULATIONS SUBSYSTEM
D. FEDERAL REPORTING SUBSYSTEM
E. VARIANCES AND EXEMPTIONS (V&E) SUBSYSTEM
F. SANITARY SURVEYS SUBSYSTEM
G. ENFORCEMENT ACTIONS SUBSYSTEM
H. OPERATOR AND MAILING SUBSYSTEM

A. PUBLIC WATER SYSTEM (PWS) INVENTORY SUBSYSTEM

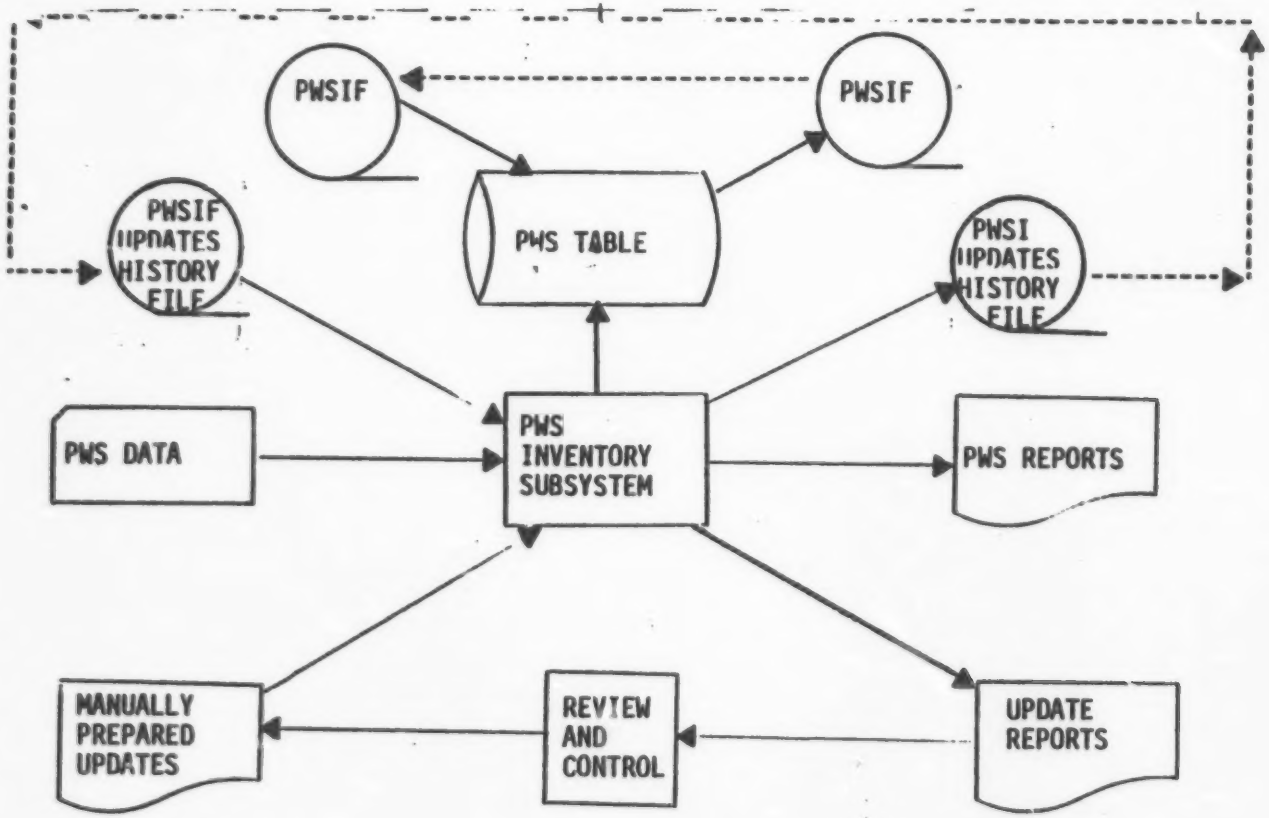
SUMMARY:

The purpose of this subsystem is to maintain basic descriptive data about public water systems such as name, address, type of system (community or non-community), population served, number of service connections, sources of water, etc. This data will be kept on a PWS Inventory File (PWSIF) to facilitate operation of other subsystems. The function of the PWS Inventory Subsystem is to create and maintain this file.

Input to the subsystem will be from source documents which can be compiled from existing manual or computer records and from data collected during a sanitary survey. States can design their own form or use the preprinted turnaround document available with the system. The regular process is to read the input transactions and edit and verify all verifiable data. Transactions without errors will be used to update the PWSIF file. An error list will be produced to facilitate correction of transactions in error. The system will produce the following key reports for use by state officials.

KEY REPORTS

NAME	DESCRIPTION
1. Condensed Listing	1. Quick reference list containing key data for all or a selected group of PWSs.
2. Production and Capacity Data	2. Displays production and capacity data for all or a selected group of PWSs for planning and surveillance purposes.
3. State Discretionary Data	2. Shows system specific data representing special conditions for which a state is given discretionary authority to set standards.
4. Comprehensive or Status Lists	3. Shows all data elements on file for a PWS.



THE PWS INVENTORY SUBSYSTEM

B. WATER QUALITY COMPLIANCE SUBSYSTEM

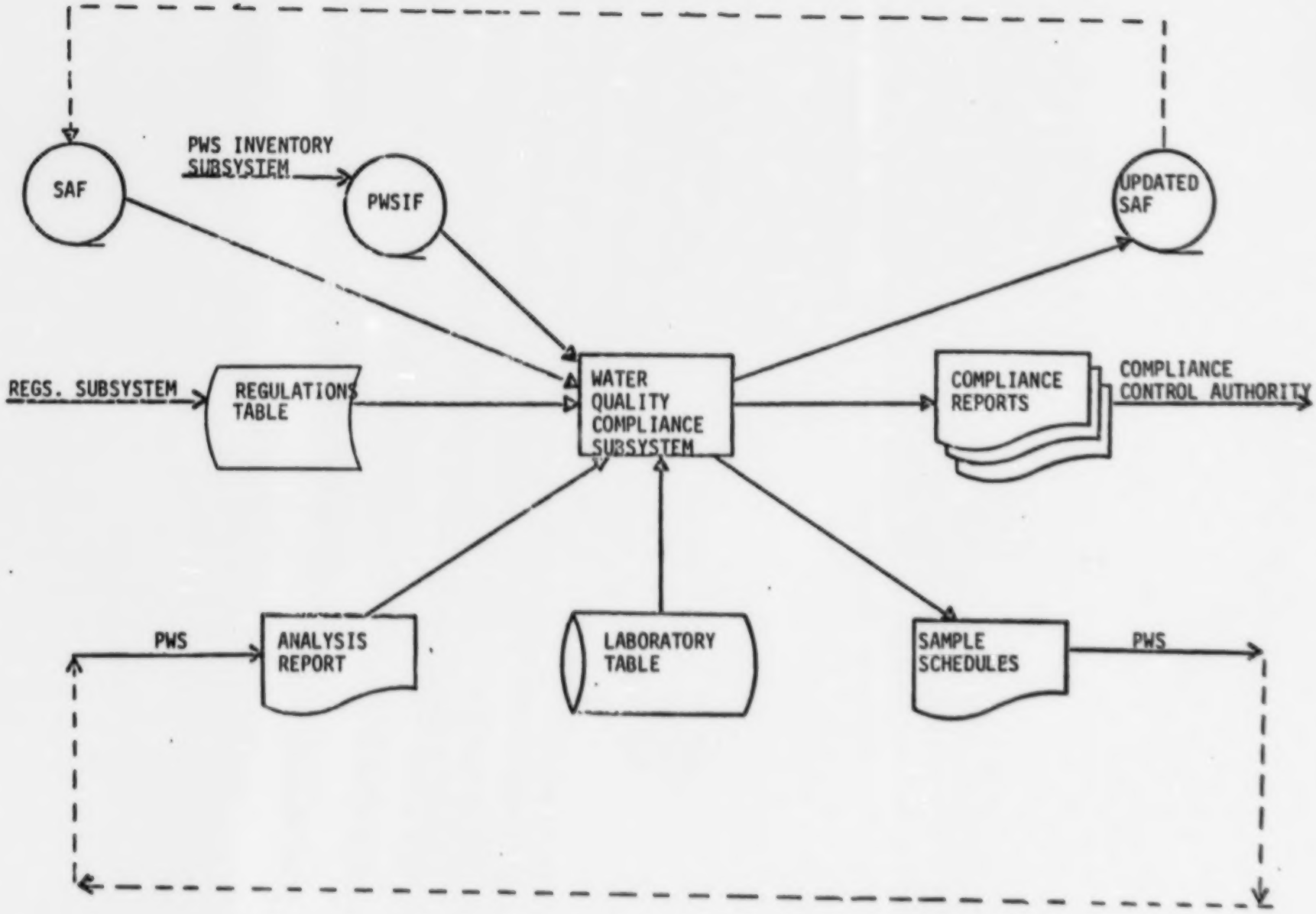
SUMMARY:

The main purpose of this subsystem is to provide state water supply managers with the information required to monitor water quality in accordance with both Federal and state regulations. It will maintain records of water samples and lab results, identify violations of maximum contaminant levels and minimum sampling requirements, alert state officials to violations requiring public notification, provide optional scheduling of sampling and analysis, and produce a number of detail and summary reports of compliance.

KEY REPORTS

NAME	DESCRIPTION
1. List of Samples in Violation of chemical and radiological standards	1. Lists water samples which exceed the maximum contaminant levels.
2. List of Public Water Systems in Violation of Minimum Sampling Requirements	2. Identifies Public Water Systems which are in violation of minimum sampling requirements for various contaminants.
3. Summary of Bacteriological Analysis	3. Shows by Public Water System and by analysis method such data as the total number of samples required and taken and the mean, high value, and low value of the results for a selected period.
4. Summary of Turbidity Analysis	4. Shows by Public Water System such data as the total number of samples required and taken and the mean, high value, and low value of the results for any selected period.

KEY REPORTS (CONTINUED)	
NAME	DESCRIPTION
5. Summary of Chemical and Radiological Analysis	5. Lists results of chemical and radiological analysis for every sample taken in a selected period for a selected group of contaminants and shows the mean , high value, and low value by Public Water System ..
6. Compliance Summary	6. Lists by Public Water System violations of MCLs, minimum sampling frequencies, and other violations for a selected period and shows totals by PWS and administrative units.
7. Sample Scheduling Forms and Reports	7. Forms and reports that can be used to schedule sampling by PWS for a given reporting period and for various contaminants; some of these may be used as turnaround documents for data entry purposes.
8. Public Water Systems Late in Submitting the Monthly Operations Report	8. Lists Public Water Systems that are required to submit a monthly operation report, and failed to do so.



THE WATER QUALITY COMPLIANCE SUBSYSTEM

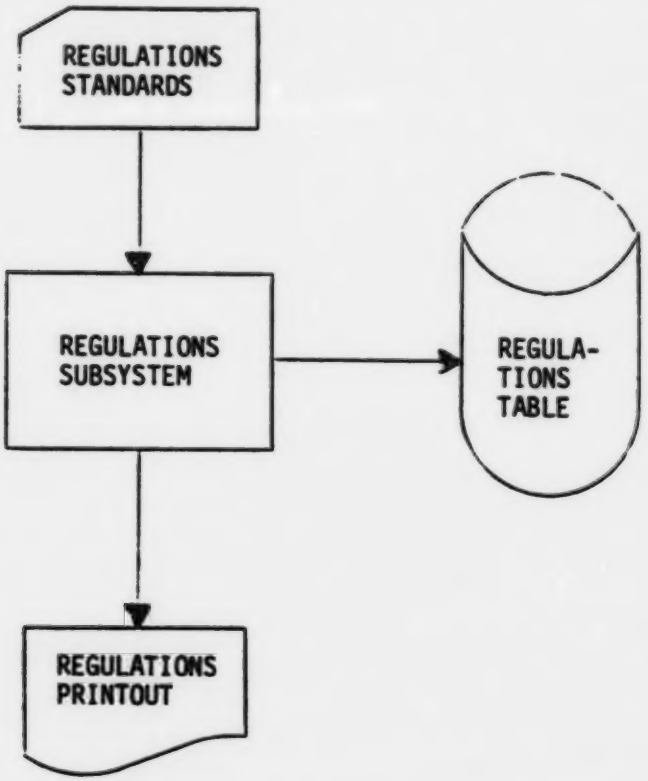
C. REGULATIONS SUBSYSTEM

SUMMARY:

The purpose of this subsystem is to create and maintain the Regulations Table which contains the National Interim Primary Drinking Water Regulations as well as the state's own regulations. Due to its small size and infrequent updating, the table will be recreated each time it is changed. For the national regulations, EPA will probably maintain the table centrally and issue new versions to all users whenever it is changed.

KEY REPORTS	
1. Regulations Table Printout	1. This report lists all the data elements maintained in the Regulations Table such as the MCL of the various contaminants, sampling frequencies, population size categories, etc. This list can be used to visually verify that all data in the table correspond to the regulations.

REGULATIONS SUBSYSTEM



D. FEDERAL REPORTING SUBSYSTEM

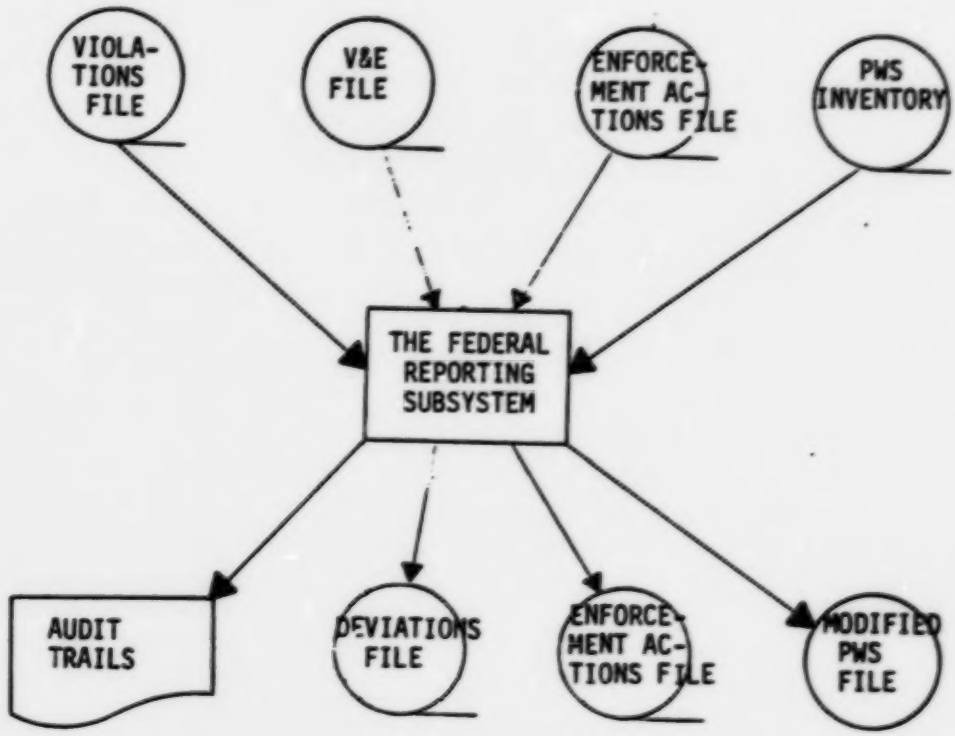
SUMMARY:

This subsystem will produce the data required for annual reporting to EPA, including a record of all violations, variances, and exemptions ("deviations") and complete records of all PWSs that were updated in the preceding calendar year. The system will retrieve all required data elements from other system files, reformat them, and create a file for reporting to EPA. By using this subsystem, the state can satisfy annual Federal reporting requirements without having to prepare special written documents.

KEY OUTPUTS

NAME	DESCRIPTION
1. Modified PWS File	1. A magnetic tape in the format required by EPA containing records of all PWSs that were changed in the previous year.
2. Deviations File	2. A magnetic tape in the format required by EPA containing a record of all deviations (violations, variances, and exemptions) from the National Interim Primary Drinking Water Regulations.
3. Enforcement Actions File	3. A magnetic tape which is a copy of the Enforcement Actions File maintained by the state. This file is available only if the optional Enforcement Actions Subsystem is implemented.
4. Audit Trail Reports	4. Reports are prepared for the files provided to EPA for reference purposes.

FEDERAL REPORTING SUBSYSTEM



E. VARIANCES AND EXEMPTION SUBSYSTEM

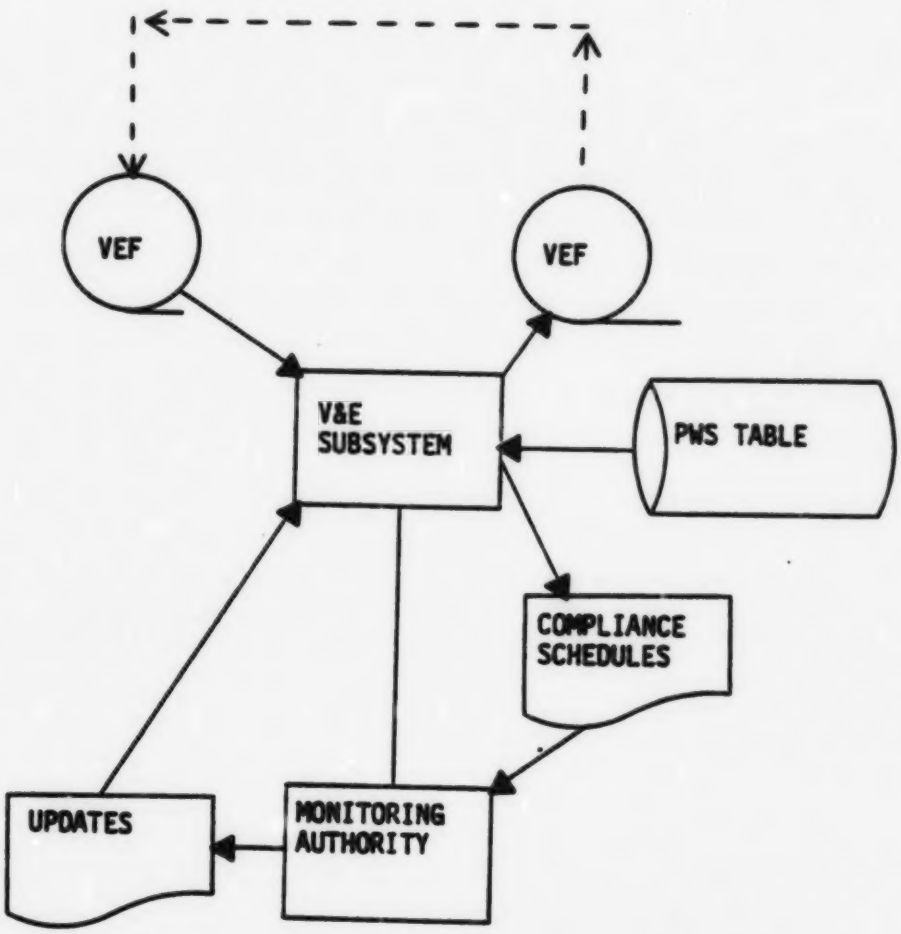
SUMMARY:

The Variances and Exemption (V&E) subsystem maintains V&E information for two purposes. First, this type of information is required by EPA. Second, information is required for monitoring progress against compliance schedules specified in particular variances and exemptions for particular public water systems. If a variance or exemption is granted, the state must prescribe a schedule for compliance and interim control measures within one year of the date it is granted. Reports produced by the V&E subsystem will allow states to monitor adherence to the schedule.

KEY REPORTS

NAME	DESCRIPTION
1. Case History	1. Lists of all data elements maintained for a V&E, including treatment technique, modified MCL, narrative explanation, and the entire compliance schedule. Various selection options provided.
2. Projected Milestones	2. Shows the schedule of milestones by PWS that must be completed within a specified period.
3. Late Milestone Report	3. List of PWSs that failed to report scheduled milestone completions.
4. Condensed V&E List	4. Lists key data elements for selective reporting of V&Es, such as V&Es for a specific contaminant or with a certain status.

THE VARIANCES AND EXEMPTIONS SUBSYSTEM



F. SANITARY SURVEY SUBSYSTEM

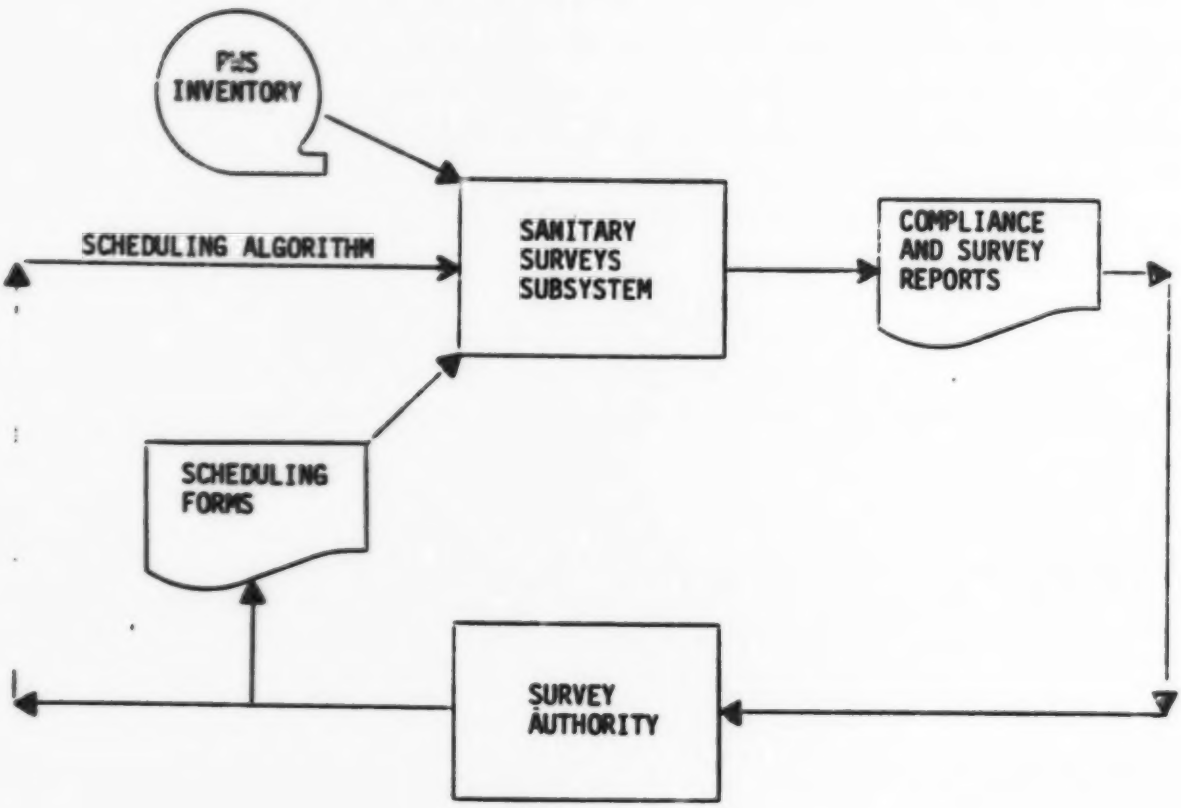
SUMMARY:

The purpose of this system is to provide a method of scheduling Public Water Systems for periodic sanitary surveys, in order to effectively utilize scarce trained manpower resources. The scheduling algorithm selects PWSs for surveys based upon PWS type (community or non-community), size of population served, compliance history, and date of last survey. States may assign varying weights to each factor to reflect their own special priorities and resource constraints.

KEY REPORTS

NAME	DESCRIPTION
1. Sanitary Survey Schedule	1. Rank ordering of PWSs by priority, showing name, address, and the scheduling criteria. This report can be used both to experiment with different weighting schemes and to print the final schedule for a given period.
2. Computer Printed Survey Forms	2. A computer printed turnaround document used for updating the PWS inventory record.

THE SANITARY SURVEYS SUBSYSTEM



G. ENFORCEMENT ACTIONS SUBSYSTEM

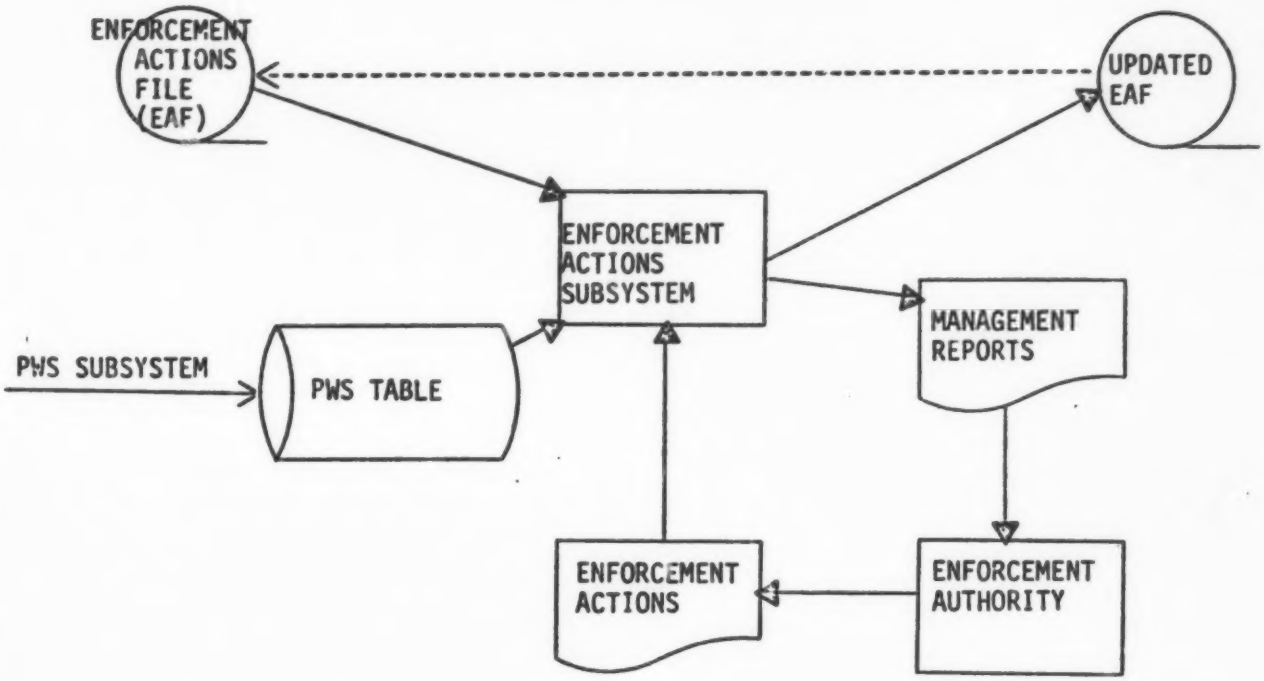
SUMMARY:

The purpose of this subsystem is to provide the state with a method for collection, maintenance, and processing of data related to actions performed in connection with enforcing the state's own regulations or the Federal Regulations. Types of actions include warning letters, permit revision or suspension, and legal action (lawsuits). This data can then be used for evaluating the effectiveness of different types of enforcement actions and can also be used in case tracking.

KEY REPORTS

NAME	DESCRIPTION
1. Case History	1. Displays all data elements maintained for an enforcement action, such as case number, defendant, plaintiff, violations, list of milestones, and case abstract. Selection options provided.
2. Condensed List	2. Reference list of key data elements for selected enforcement actions.

THE ENFORCEMENT ACTIONS SUBSYSTEM



H. OPERATOR AND MAILING SUBSYSTEM

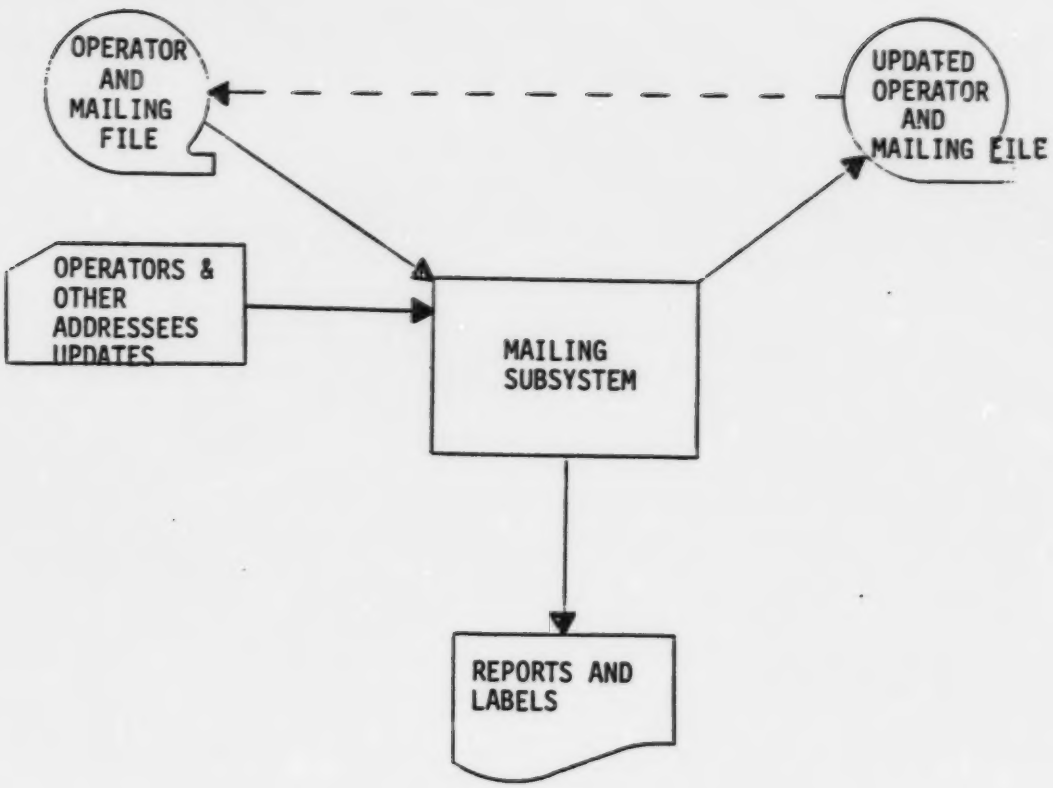
SUMMARY:

The Operator and Mailing Subsystem is designed for two purposes: first, to provide management with data concerning certified operators, and second, to provide the state with the capability to manage a mailing distribution list for mailing material to local governments, cities, consulting engineers, etc. Since the mailing list and operator data requirements are essentially the same, these two functions are combined in a single subsystem.

KEY REPORTS

NAME	DESCRIPTION
1. Certified Operator List	1. This report is used for listing operator records whose addresses have a missing data element such as name, state, and zip code. The same report can be used in conjunction with the selection option to list operator data according to various criteria.
2. Distribution List	2. This report lists address records that have missing data elements such as name, street address, state, and zip code. The same report is used in conjunction with a selection process to list addresses data according to various selection criteria.
3. Mailing Labels	3. Mailing labels sorted by zip code. A selection option is provided to select addresses for listing by distribution type.

MAILING SUBSYSTEM



III. OPERATIONAL HIGHLIGHTS

The previous section described MSIS components and presented a static picture. In this section we describe MSIS as a process, beginning with how the system is set up, continuing with regular, scheduled operations, and concluding with optional, non-recurrent processing.

A. Setting-up MSIS

Before MSIS can function, its operating environment must be prepared. In general, the following steps should be followed:

1. A review, by water supply control and data processing personnel, of MSIS documentation.

2. A decision on which subsystems to implement.

3. Design and preparation of input and output forms, based on state regulations and preferences, and on form prototypes provided with MSIS documentation.

4. Programs installation. This step includes copying the MSIS programs to the states' computer programs library and verifying that they can operate on the state computer.

5. Tables preparation. This step includes preparation of code tables as required by various programs of MSIS, such as the Regulations Table (the input for the Federal regulations will be supplied as a punched cards deck), and the Laboratory Table.

6. Create initial PWS Inventory File. The first version of the PWS Inventory File (PWSIF), will be supplied by EPA on a magnetic tape which is prepared from information that exists on the National PWS Inventory File. When all the previous steps are completed, the file is listed to provide a comprehensive list of all PWS records on the file. A review of the list is required to correct, add and change the information, using the programs of the PWS Inventory Subsystem. By the end of the review period, a basic inventory file of public water systems is ready.

7. Determine operations schedule. MSIS is designed to offer the states flexibility to choose their individual operations schedules, and the final step of the set-up phase is to adopt a run schedule for each subsystem.

B. Regular Production

1. PWS Inventory Subsystem

A periodical (e.g. bi-weekly) updating of the PWSIF is all that is required as a regular production of this subsystem except during the first two years while many new non-community PWSs are being posted to the file and more frequent production may be needed.

2. The Water Quality Compliance Subsystem

a. Compliance Cycle

This subsystem is designed to be processed periodically in accordance with PWS reporting periods (typically a month or a quarter. In order to achieve an even spread of the work through the month, a state may wish to allocate PWSs into several compliance cycles, by defining the day in the month on which a PWS must report. Suppose that a state has to monitor 5000 PWSs; they may be divided equally between four cycles. By assigning the numbers - 01, 08, 15, and 22, it is known to MSIS which PWS must report on the first, second, third, and fourth week of the month. This arrangement means that for every week it is checked whether all PWSs that must have to report by that date (and allowing 10 more days for data entry) have done it.

b. Scheduling PWSs for sampling

Each week the scheduling modules scan the PWSIF and identifies PWSs required to submit sample analysis results. All the necessary reporting forms are printed and mailed to those PWSs (including sample bottles) thus notifying them in advance of the contaminants and number of samples required, and providing them with the necessary input forms. PWSs should use these forms for submitting samples for analysis and for reporting to the state.

c. Data Entry

Results of analysis are received daily from the laboratories, keyed, and entered to the system. This process has to repeat two to three times a week, depending on data volume. Following each data entry run an error report is produced, listing sample data that was rejected during data

entry. This data must be checked, corrected, and reentered in the next data entry run.

d. Compliance Reporting

A periodic summary process summarizes the data that has been entered during the period and produces compliance reports showing PWSs that did not comply with sampling requirements and water quality standards (MCL). A Violation File is updated with records containing the details of these violations, and data on other violations through manual inputs. The sum of all the violations posted to the Violations File is produced in one report showing, by PWS, all violations that were detected.

e. Summary

The basic sequence of production during one reporting period is: scheduling, input of sample data, summary of sample data, and reporting. It should be noted that the character of MSIS as a batch system means that identification of violation will lag after the occurrence and so the Water Quality Compliance Subsystem cannot replace a telephone call from a laboratory.

3. Regulation Subsystem

There is no need to operate this subsystem unless there was a change in the regulations in which case the applicable input forms are filled, keyed and entered. Output reports must be carefully verified to ensure that the Regulations Table is correct and if any errors were detected, they must be corrected by repeating the process until errors are no longer detected.

4. Federal Reporting Subsystem

The regular production of this subsystem in an annual run which produces the files and reports that are required under the National Interim Primary Drinking Water Regulations.

5. Variances and Exemptions Subsystem

This is an optional feature of MSIS. The Variances and Exemptions File (VEF) is built gradually over time by entering new V&E's data to the subsystem. The production cycle will generally be monthly: data is entered

and after it is cleared of errors, the two monthly reports are produced:

a. Projected Milestones

b. Late Milestones

These reports perform the function of alerting states' personnel to PWS that must report completion of a milestone and PWSs that did not do so, thus enabling the state to take proper action.

6. Sanitary Survey Subsystem

There are two distinct phases in operating this optional subsystem.

a. To establish the proper combination of parameters applied to the algorithm for surveyselection. Once the formula is found, it need not be changed unless the states approach has been changed.

b. The regular production will generally consist of a monthly production of a list of PWSs that are scheduled for sanitary survey, the results of which are used to update the PWSIF.

7. Enforcement Actions Subsystem

This is an optional feature of MSIS. When a state wishes to implement the subsystem it starts by building the Enforcement Actions File (EAF) as enforcement actions are taken. The only regular process associated with this subsystem would be monthly data entry and update; report production is only by request.

8. Operator and Mailing Subsystem

This subsystem, too, is an optional feature. The Operator and Mailing File (OMF) is created initially by entering the data about all known operators and addressees. From then on regular production is done monthly or bi-weekly and consists of data entry and updating the OMF; report production is on request only.

C. Optional Production

Regular production, as described above, is adequate for collection and maintenance of data and for monitoring compliance during the current reporting period, but state officials may wish to use the data they maintain for other purposes. For example, it may be necessary to identify all public water systems using a specific treatment method; to schedule classes for certified operators; to review all enforcement actions cases which are still pending, etc.

In order to accomodate such ad hoc production, MSIS provides a simple selection language. Requests for a retrieval of specific data are submitted to a "selection process" which performs the task of applying selection criteria to MSIS files, retrieving the requested data and displaying it as required. MSIS selection capabilities are not the same as a report generator because report formats are fixed; the user controls the data to be displayed rather than the exact format. This drawback is partially compensated by having a variety of report formats. States which employ large computer systems usually have one or more general purpose report generators installed (e.g. EASYTRIEVE, DYLACOR). By using such software they can easily obtain additional report formats.

A report selection process is designed for the following subsystems:

- Public Water Systems Inventory
- Water Quality Compliance
- Variances and Exemptions
- Enforcement Actions
- Operator and Mailing

It should be noted that although the process of scanning a file, selecting and sorting the required data and producing a report involved several steps the user is unaware of since it is done as one production job. The formats to be used in requesting special reports will be developed during detailed design.

The following example demonstrates how the selection process can be used:

A state may change the MCL for turbidity for an individual PWS from 1 TU to 5 TU. Assume that state officials want to review all PWSs for which an MCL of more than 1 TU is allowed, and that the drinking water control function is decentralized.

A request is submitted to produce the State Discretionary Data report (see section I.A) by selecting all PWSs that are allowed a modified MCL for turbidity of more than 1 TU. The data is to be sorted by regional office and PWS name.

Following the production, a list of PWSs is sent for review by each regional office.

To summarize, the following table displays a sample operating schedule for MSIS.

SAMPLE OPERATING SCHEDULE FOR MSIS

		Weekly	Monthly	Annually
1.	Inventory Update	X		
2.	Sample Data	X		
3.	Sample Summary and Sample Scheduling (staggered)	X		
4.	Compliance Summary		X	
5.	Regulations Table	(as required, when regulations change)		
6.	Federal Reporting			X
7.	Variances and Exemptions		X	
8.	Sanitary Survey		X	
9.	Enforcements		X	
10.	Operators and Mailing		X	
11.	Optional Report Requests	(combined with the appropriately scheduled subsystem run, where possible; special run possible for urgent requests)		